Title of Paper: Evaluating Optical Laser Disk Storage and Retrieval Systems for Non-Print Access at the National Agricultural Library

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National Agricultural Library

Introduction

The historical roots of the development of the first optical disk for storage of television images probably began in the 1920's with the pioneering efforts of James Logie Baird who experimented with mechanical scanners and display devices. Broadcast programming began, on a very modest scale in the 1930's. Fuzzy images on tiny screens showed events such as the 1932 Munich Olympics, and the Coronation in Great Britain. The BBC began regularly scheduled programming in 1939. Television technology benefitted from the development of radar during World War Two, and television's popularity in America grew from its introduction following the war to an obsession in the 1950's and the major factor it is in our society today.

Image quality improved. But, until the middle 1950's, television was "live" or on film. The only way to save a program was to make a kinescope, a motion picture shot directly off the television tube. Magnetic tape technology, developed for audio recording, was soon adapted for video recording. It took twenty years to refine video tape recording so that it was practical for home use.

The invention of the laser held promise for many new applications, but it also took nearly twenty years, until the early 1970's, to develop and refine a device to reproduce high quality images on a television screen. Home laser video players were produced and thousands of motion pictures were distributed and sold on laser disk. But, because of the cost of the laser unit, laservideo disk equipment was more expensive than home videotape players and non-optical video disk players. It failed on the consumer market, but its use continued in industry because of several unusual characteristics:

1. Laser disk images show no wear and no degradation of quality from repeated use.
2. An image can be located precisely on a laser disk and that location address doesn't change.
3. Laser disks are an ideal medium for multi-path, programmed instruction.

Today, the popularity of audio compact-disk players has resulted in development of lighter lasers, and thus, faster optical disk drives, and has resulted in some over-all reduction in price.

As we close out the 1980's, optical laser disk technology is a revolution in the making which will change how we store, retrieve, distribute, utilize and display photo and art collections, and other rare and fragile materials.

The Forest Service Photograph Collection Laser Disk Project

Today, the National Agricultural Library is actively involved in evaluating optical laser disk technology and its application to visual and textual knowledge in agriculture. In particular, the Forest Service Photograph Collection Laser Disk Project entailed putting the browsing files of the Forest Service historical photo collection on disk and building a data base on a personal computer, searchable under many strategies, and able to display the picture and accompanying information on adjacent video screens.

The Forest Service Photograph Collection was started in 1898, under the direction of Gifford Pinchot (1865-1946) who was appointed Chief of the Division of Forestry. In that leadership capacity, Pinchot required his forestry agents to include photographs, and good documentation, in oversight reports from the field. The project's main focus was the browsing files, which contain 60,000 of the most frequently requested and reprinted captioned photos from the collection.

In 1985, the U. S. Forest Service provided a research and development grant to produce the laser disk. NAL signed a cooperative agreement with the University of Maryland Library Non-Print Media Center to perform the work.

Work Plan: NAL/Forest Service Photo Collection Optical Laser Disk Project

- Project Managers: NAL - William G. Hauser, and UM - Alan Rough;
- Project Workers: NAL - Alan E. Fusonie, William G. Hauser, and volunteers; UM - Paul Malec, Alan Rough, and four students; Patrick Taylor, Chris Schlesiger, Roopa Mangalmurti, and Beth Sammons.
- Project Location: NAL Special Collections, Beltsville, Maryland;
- Work Organization: Work teams of two, from July to mid-September 1986;
- Imaging: Forest Service Browsing File mounts were photographed on color-negative 35mm motion picture film.
- Initial Data Base Entry: As the pictures were photographed by one team member, the partner entered in C-Quest (a commercially available photo data base management system from Image Concepts, West Boylston, MA) information about the photo, including subject, location, photographer, date taken, accession number, and other important data;
- Quality Control: Project workers performed a series of processing and quality control evaluations of data input, image quality, and later reviewed a laser check disk for quality and field-dominance errors;
- Commercial Disk Production: A professional television studio transferred the motion picture film to broadcast-quality videotape, and 3M Corp. produced the check disks and the final disks ;
- Disk Album Cover: Produced at UM, using a Macintosh for the text, by Marianne C. Rough;
- Data Base Linking for Laser Disk Image Finding: After delivery of the completed disk, NAL Staff added the disk location number of each image to its corresponding C-Quest data base record.

Mastering Costs

Basic mastering and replication costs include the following items:

- Creating two check disks for verification of material before mastering: $1,500.00
- Cost of creating a disk pressing master, including transfer of 60 seconds of live-action motion picture film: $ 2,400.00
- Pressing four hundred copies at $ 12.00, one side: $4,800.00

Total: $ 8,700.00;

Each disk cost $21.75 to manufacture not including the cost of developing the media on the disk. Average manufacturing costs have declined by about 1/3 since 1986.

Description of the Completed NAL/Forest Service Photo Collection Laser Disk

The Completed NAL/Forest Service Photo Collection Laser Disk contains over 34,000 black and white photos in 69 general subject chapters, 500 color slides, 55 botanical illustrations, 175 maps, and an award-winning, 60 second Smokey Bear public service announcement. The data base is recorded on magnetic media and occupies about 16 megabytes, including the NAL version of the C-Quest Subject Dictionary.

Benefits

Optical laser technology may revolutionize the way in which users approach photo research. The Forest Service laser disk has already accomplished the following:

- Improves awareness and increased speed of image access to the Forest Service Browsing File located at the National Agricultural Library;

- Provides the photo researcher with quick and efficient image access to major

portions of the browsing files without examining the original photo mounts;

- Allows access to each photo in the Browsing File through many, rather than just one search-access point;
- Provides users away from NAL with an efficient way to review, identify, and order photo reproductions;
- Provides Forest Service photos in a video format for use in videotapes or computer digitization;
- Reduces handling of original photo mounts and prints in Browsing File which compliments archival and preservation efforts;
- Helps reduce travel and lodging costs often associated with photo research.

The USDA/OGPA Photograph Collection WORM Disk Project

As a part of the U. S. Department of Agriculture's Productivity Improvement Program, a review team was created. Included on this team were visual information specialists from USDA Agencies such as;

APHIS	Animal and Plant Health Inspection Service
ARS	Agricultural Research Service
FS	Forest Service
FSIS	Food Safety Inspection Service
SCS	Soil Conservation Service, and
OGPA	Photographic Section, Office of Government and Public Affairs, of the U. S. Department of Agriculture

OGPA houses the centralized USDA files of current and historic photographs. It was the recommendation of the team that USDA photo collections within the agencies, and the central USDA collection be put on laser disk. In September of 1987, the USDA transferred money to NAL to establish new cooperative agreements, one with University of Maryland for student aides and technical production support, and another

at Catholic University for library students to do photo cataloging/indexing at NAL. The existing but outmoded manual USDA photo reference system, based partly on human memory, with scattered local photo files, difficult to access and slower than desirable response time, would soon be replaced by WORM laser disk technology driven by the C-Quest photo data base management software system to control and display a laser disk generated image and accompanying data on adjacent video screens.

Work Plan: NAL/OGPA Photo Collection Optical WORM Laser Disk Project

- Project Managers: NAL - William G. Hauser, and UM - Alan Rough;
- Project Workers: NAL - William G. Hauser, Claudia Weston, and Ronald Young; UM - Alan Rough, and one student, Pat Taylor; Catholic University, John Fay;
- Project Location: NAL Special Collections, Beltsville, Maryland and remote search site, USDA, OGPA, Washington, D.C.;
- Work Organization: Individual workers, beginning April 1988;
- Imaging: Photographs selected by OGPA are recorded as still frames on an 8-inch Panasonic WORM (Write Once Read Many) Optical Laser Disk using a high-resolution Sony 3CCD (Charge Coupled Device or "chip") Camera; Certain areas can be enlarged as an additional exposure;
- Quality Control: During Imaging, project workers evaluate image quality, by viewing on a 19-inch Sony Trinitron Monitor; A poor image cannot be erased, but since no record of a poor image is entered in the data base, none will be seen by the user ;
- Data Base Entry: Pictures previously recorded on the WORM Disk are reviewed along with information provided by OGPA and information about the photo, including subject, location, photographer, date taken, accession number, and caption information are entered in the C-Quest Photo Data Base;
- Data Backup: At least once each day the updated data base is copied to a 20 megabyte bernoulli cartridge;
- Data and ImageTransmission To Remote Site: A Iomega bernoulli disk cartridge containing the data base, along with a copy of the updated WORM Disk, is

exchanged with the OGPA remote search site each month;

- Commercial Disk Production: Two full 8 inch WORM disks of 24,000 images each may eventually be combined to create one12 inch commercial disc for external distribution;
- Data Base Linking for Laser Disk Image Finding: Linking is done during the entry of the C-Quest data base record.

Benefits

Laser WORM disk technology will allow more people to access and view a greater number of photos and result in improved service to the media and other users of USDA photography. Analog WORM disk technology allows photos to be added to a currently in-use optical disk both quickly and easily creating a true photo data base without an unacceptable penalty for storage of large amounts of picture data.

Specifically achievable benefits from this photo project are;

- To Increase the use of USDA photographs through broader access and wider distribution;
- To increase the size, scope, quality, and usefulness of the photo library as USDA Agencies contribute their specialized photos to the system;
- To broaden and expedite service to the media and the public through remote user video workstations and through a sophisticated data base cross-referencing and search capability;
- To achieve secure, archival protection of irreplaceable original negatives, prints, and transparencies;
- To create a data base that will be an efficient, permanent, finding system for photographic images, now stored at USDA, which will later be offered to the National Archives and Records Administration (as required by law);

- To increase the value and visibility of photo documentation to those in top management positions;
- To be able to read, use, and update continuously with a WORM disk;
- To readily reproduce reference copies inhouse at NAL using WORM disk, computer, and printer, or to digitize and transmit reference copies to people who have FAX equipment;
- To provide photos in a video format for use in videotapes or computer digitization;
- To achieve long term savings in labor costs through more cost-effective access with less dependence on human expertise and "institutional memory;"
- To build a data base finding aid easily used with a future commercial disk with little or no modifications;
- To establish and maintain a mastering and disk authoring system with long term capabilities and cost effectiveness in terms of future photo collections.

Basic mastering and authoring system costs include the following:

Sony high-resolution "chip" camera (3 CCD)	$ 5,170
Panasonic 8-inch WORM Player-Recorder (analog)	12,500
Panasonic 8-inch WORM Player (analog)	3,500
Ten 8-inch WORM disks (analog)	1,300
Color Television Monitor (19 inch Sony)	700
Compaq Deskpro 386-130 Computer	7,900
C-Quest Photo Indexing Software	3,000
Iomega Bernoulli Box (20 MB) and controller	1,550
Bernoulli cartridges (3)	270
Total.....	$ 35,890

Comparison of Features and Characteristics of NAL/Forest Service and NAL/OGPA Optical Disks

	NAL/FOREST SERVICE DISK	NAL/OGPA WORM DISK
Access:	Photographs were filmed on 35 mm motion picture film, and transfered to broadcast quality videotape from which a check disk is made for quality control, then a master is made to manufacture analog commercial disks.	Using a high-resolution color video camera, photographs are recorded directly on an analog WORM disk which is immediately usable. Individual duplicates can be made.
The creation process:	Creation of the disk using this process is time consuming. The image on a 19-inch monitor is the actual size of the original material.	Imaging on a WORM Optical Disk is very fast and direct with full control over image quality, color and size of the final image on the monitor.
Description:	The NAL/FS Disk has 34,000 photos and the matching data base has 34,000 entries. Data was entered in C-Quest Photo Data Base Software as the pictures were filmed as a motion picture, but the location code on the disk could not be added to the data base until the final disk was manufactured.	The NAL/OGPA WORM Disk has 8,000 photos and the matching data base has 8,000 entries, so far. Pictures are recorded on the WORM disk and then a complete data base record is created soon thereafter. The combination of picture disk and data base are continuously usable during the creation process.

The C-Quest Photo Data Base Software, with added vocabulary terms, is a fast and powerful reference tool. Users who implement the C-Quest Software will receive a copy of the enhanced NAL/C-Quest Dictionary File for use with NAL optical disks.

NAL/FOREST SERVICE DISK	NAL/OGPA WORM DISK
Searching the disk:	
Forest Service 12-inch Laser Disk may be searched in a limited fashion on a Laser disk player using the 69 chapter subjects index stops on the disk. Images can be identified by "negative number" on video image.	OGPA 8 inch Worm disk must be searched using the C-Quest Data Base. The eventual 12 inch commercial disk will require an accompanying data base.

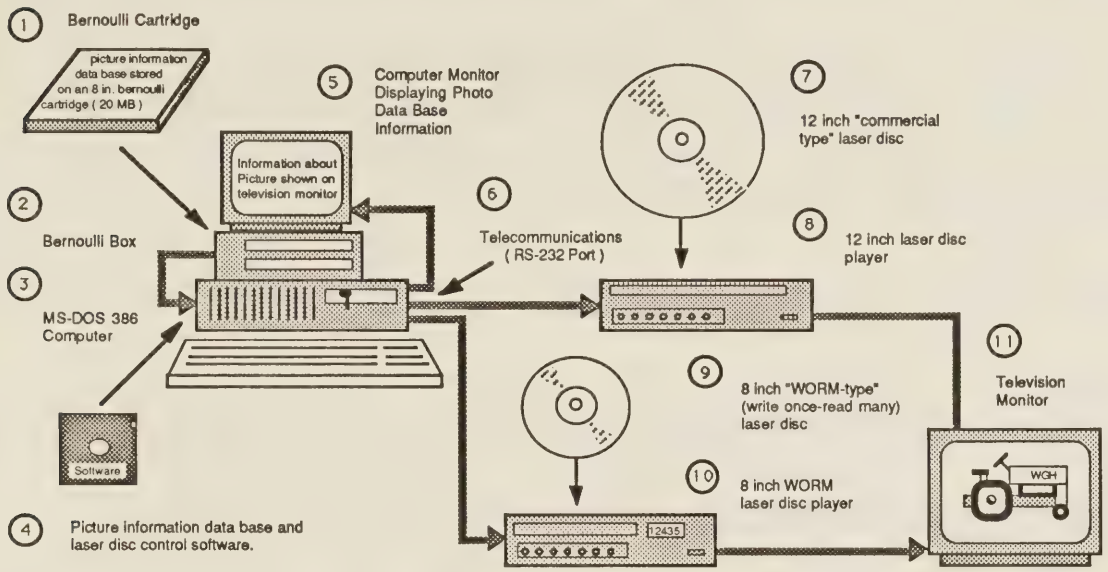
Both disks may be rapidly searched using the C-Quest Photo Data Base System, using multiple subjects, photographer, date, location, and other information.

Status:	
The Forest Service laser disk is ready for distribution.	The OGPA disk is new and the data base is still in the building stage, but it is usable, and currently being used in one remote site,during the creation process.

Conclusion

The current technological push in the optical laser disk field will be increasingly complemented by an expanded user market demand in the 1990's. New optical laser media formats, including laser cards, laser floppy and bernoulli disks, and laser optical tape will allow convenient storage of incredibly large amounts of data. NAL is actively involved in researching, evaluating, and using optical laser technology on a daily basis. Both staff and researchers at NAL are experiencing improved access, reduced handling of originals, and faster image retrieval. Appropriate utilization of this new technology can provide improved photo and text reference service opportunities for not only USDA users, but also for the users of the broader spectrum of collections of photo images and information on agriculture throughout the world.

National Agricultural Library Laser Optical Picture Disc Display System



This system is used at NAL to display laser optical disc photo finding aids: 1) A 20-MB, 8- inch *Iomega* bernoulli cartridge containing the data base for the laser disc being viewed; 2) An *Iomega* bernoulli box data storage unit; 3) A Compaq Deskpro 386-130 Computer; 4) C-Quest™ Picture Data Base Software; 5) A Computer Monitor to display information about the photo on the television monitor; 6) RS-232 Telecommunications Port; 7) The NAL-Forest Service Photo Collection Laser Disc; 8) A 12- inch laser disc player; 9) An 8- inch, Panasonic WORM Laser Disc; 10) A Panasonic 8- inch WORM Laser Disc Player; and 11) A color television monitor to show the pictures.

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Abstract

It is the purpose of this paper to discuss the pilot systems for the Forest Service and the USDA-OGPA Photo Collections Laser Optical Disks which are housed at the National Agricultural Library, focusing primarily upon the development and benefits of these systems as well as their differences and possible future improvements and enhancements; this paper will also deal with the special features of the systems such as photo storage, retrieval, and display.

The Forest Service Photo Laser Disk Project was first set in motion in the summer of 1985. By that fall, it became an official NAL pilot project to explore the effectiveness of laser video disk technology as an image storage and access medium for photo collections. The project utilized some new technology: laser optical storage of still-frame, black and white photos, color slides, and motion pictures with sound; as well as the C-Quest Photo Data Base System for direct word subject searchability and display of the photos and data on video screens. The Forest Service Browsing Files at NAL are already being searched using the laser disk without physically handling the originals. As an outgrowth of this success, a new and technically updated NAL/OGPA Project using WORM (Write Once Read Many) Optical Laser Disk technology began in the fall of 1987. Optical Laser Technology appears to be an appropriate application for improved storage, retrieval, duplication of reference finding aids, and display of many non-print , photograph, and other special collections throughout USDA and the agricultural community.